EECS/Rob 464 How To Documentation - Project 0

Red Team
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1 Introduction

The following document describes the process of building the Red Team's robot from the 2025 session of EECS 464/ Rob 464: Hands On Robotics.

The robot is a scuttle-style robot that utilizes one directional friction to push itself forward and retract to reset for the next motion.

2 Instructions

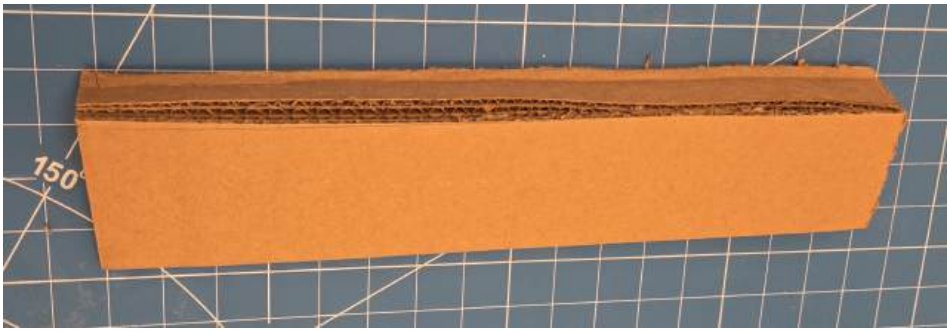
2.1 Construct Center Body

Step 1: Cut a 32cm by 8cm rectangle from a flat sheet of cardboard.

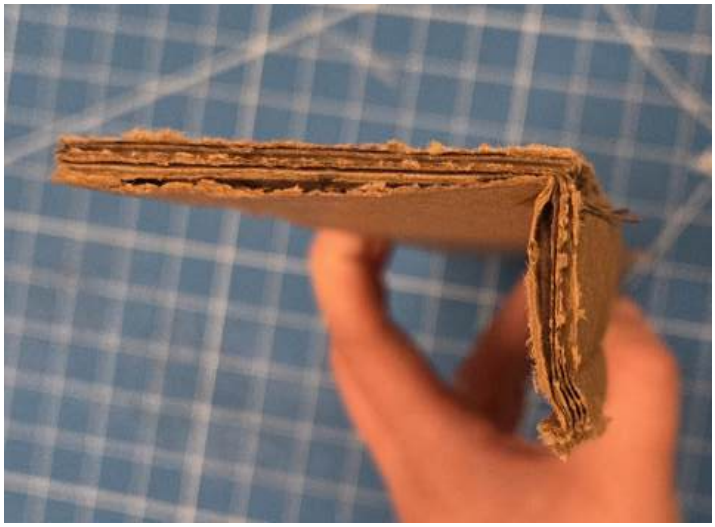
Step 2: Along one of the long edges, measure 2cm from the edge and draw a line across the length of the cardboard square.

Step 3: Use this line to score a bend along the length of the cardboard.

Step 4: Bend along the scored line to create a 90-degree corner.



Step 5: Use hot glue to fix the bend into place and let it dry.



2.2 Construct Wings

Construct 2 wings total, they should be mirror images of each other.

Step 6: Cut two rectangles with dimensions of 12cm x 10cm [A]

Step 7: Cut two rectangles with dimensions of 14cm x 10cm [B]

Step 8: Cut two rectangles with dimensions of 20cm x 10cm [C]

Step 9: Take one of **Step 6:** [A] and **Step 7:** [B] lay them side by side with a 1cm gap between them.

Step 10: Cut a strip of tape 10cm long. Affix the two pieces 1cm apart.

Step 11: Repeat on the opposite side of **Step 10:**.

Step 12: Repeat to complete two total pieces. [A|B]

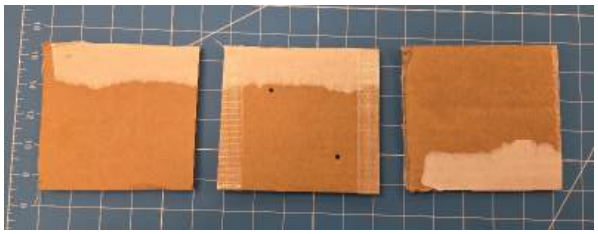
Step 13: Repeat **Step 9:** with **Step 12:** [A|B] and **Step 8:** [C] by placing [C] on the other open side of [B]. You should end up with a long rectangle with two hinges. [A|B|C]

Step 14: Repeat **Step 13:** to end up with 2 total wings.

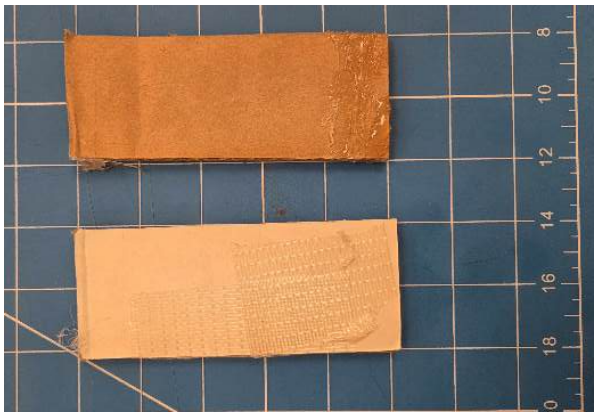
Step 15: Add a snap lock to the rectangle [C] or the long side parallel with the center body.

2.3 Construct Triangle Hinge

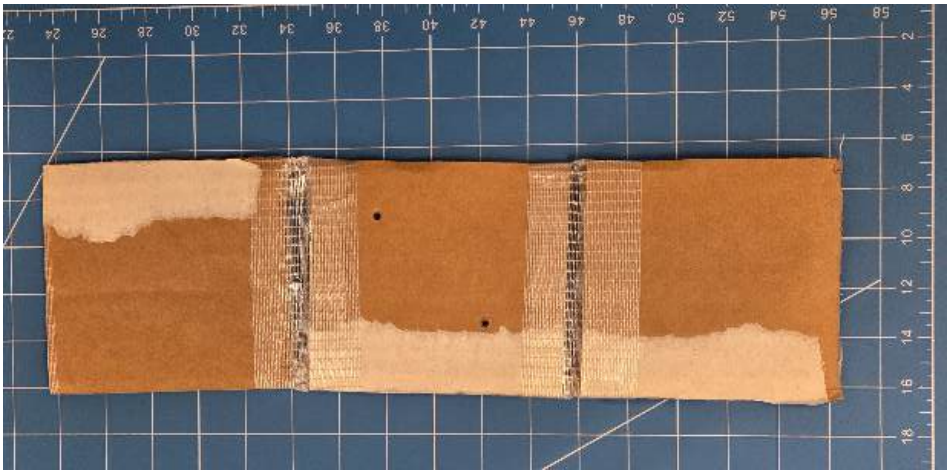
Step 16: Cut 2 (total) 10cm x 10cm squares. [D]



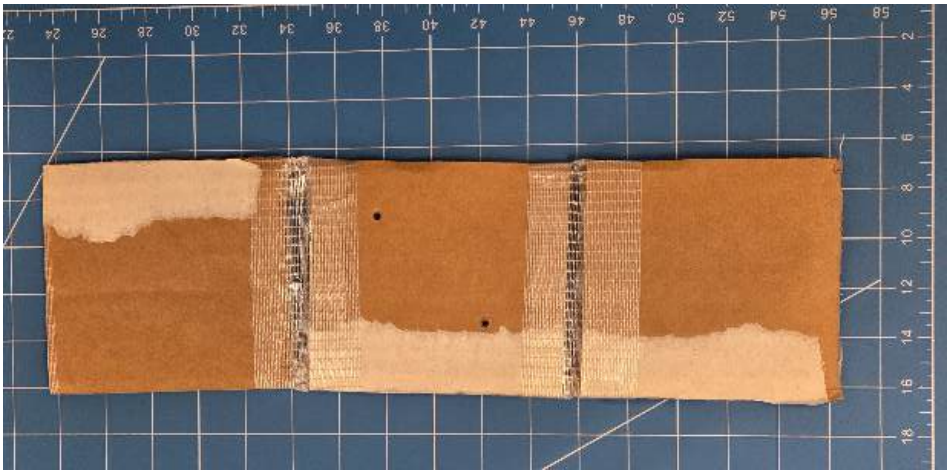
Step 17: Cut 4 (total) 10cm x 6cm rectangles. [E]



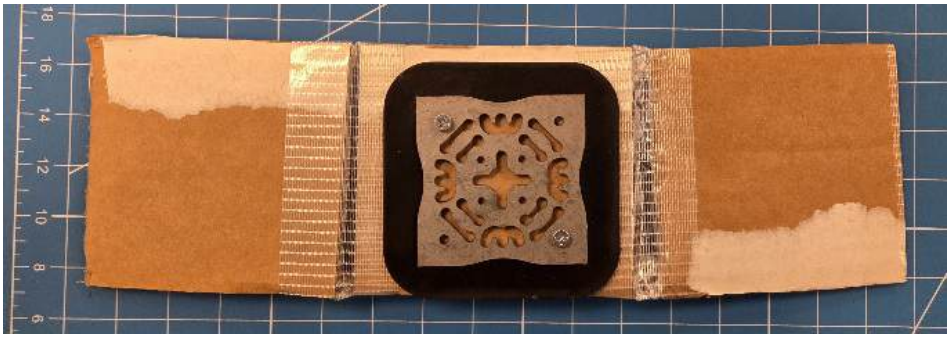
Step 18: Line the 6cm rectangles along the 10cm length against the 10cm x 10cm rectangle. There should be one of the shorter rectangles on each side of the larger 10cm x 10cm square.



Step 19: place tape along the gap, as done in **Step 10:**.



Step 20: Before constructing the final triangle, attach a snap lock mechanism to the 10cm x 10cm triangle.

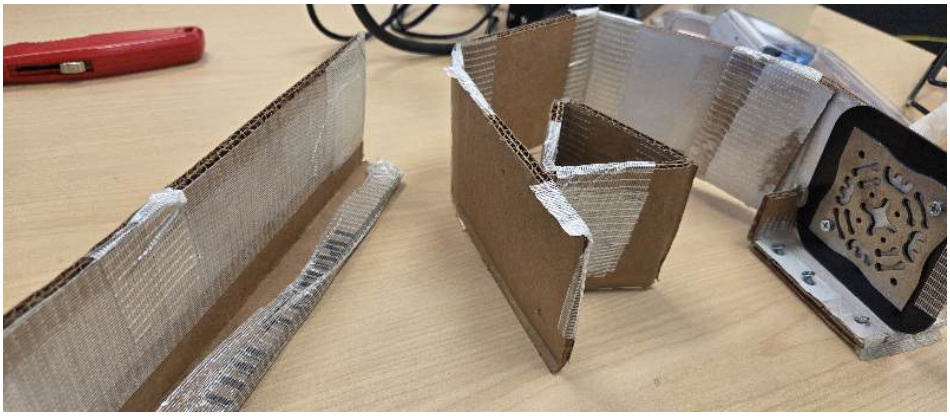


Step 21: Fix the net together to create the triangular structure. Glue it in place.

2.4 Attach Wings, and Center Body together

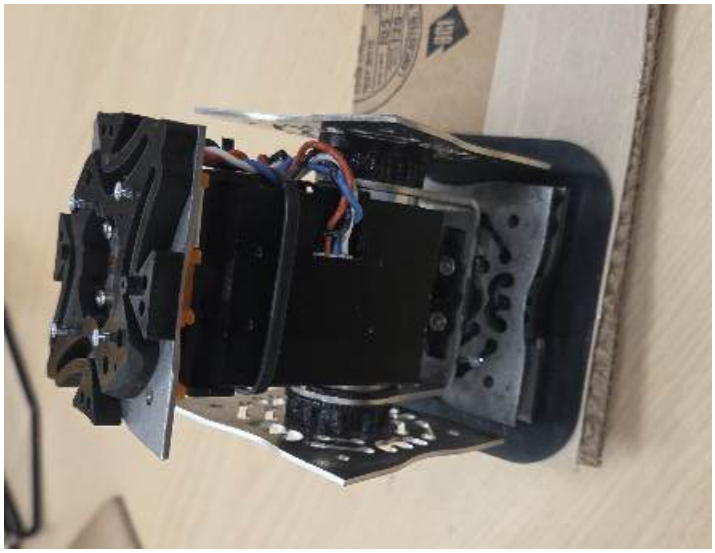
Note: This is the point where the wings will no longer be exactly the same but mirror images of each other. All of these steps should be mirrored along the center axis of the robot.

Step 22: Glue the mounting end (Panel A) of the wing to one end of the center body.

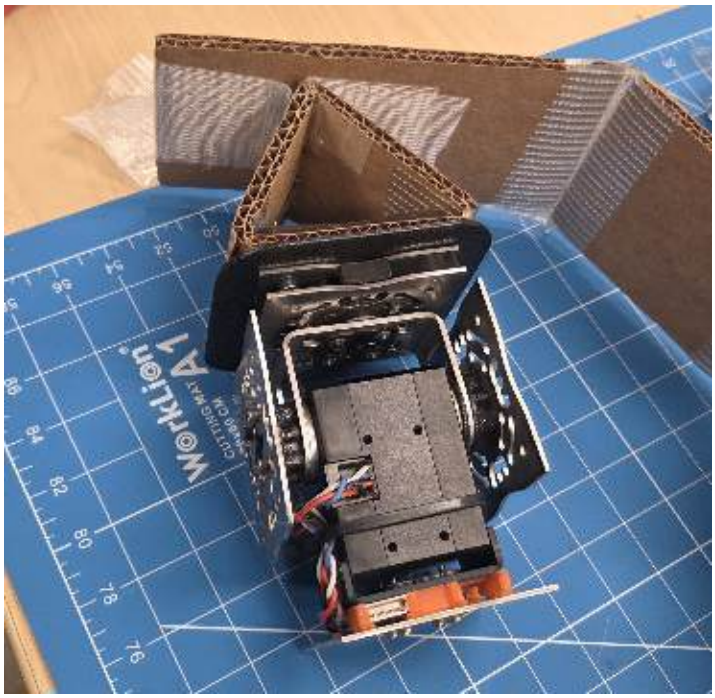


Step 23: Repeat **Step 22:** for opposite side.

Step 24: Mount one of the 190 deg motors on the wing side of the assembly.



Step 25: Mount one of the triangle hinges to the opposite side of the motor.

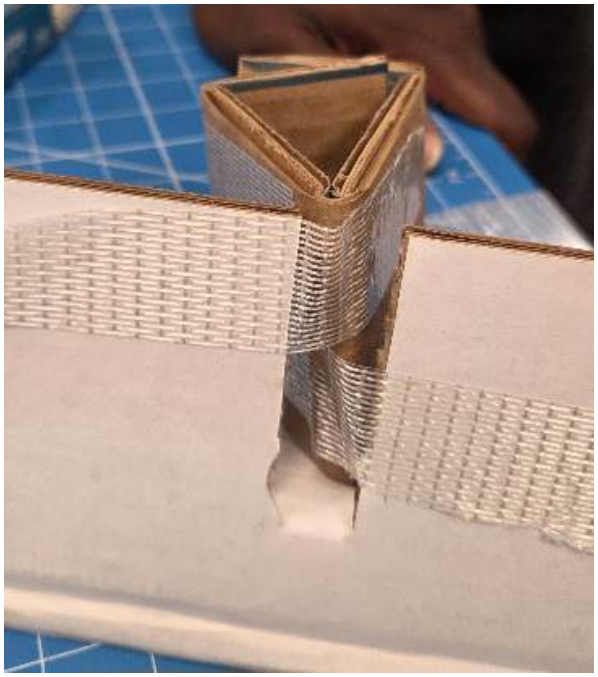


Note: Make sure that the motor is mounted in the correct orientation.

2.5 Finish the wings

Step 26: Cut a 1cm slot from the top of the center body down to the flat part.

Step 27: Using the work referenced in [FSSR17], cut thin strips of the tape to create a reinforced hinge.



Step 28: Use these tapes to alternate attaching the triangular pieces to the opposite side of the center body.

Figure 1: A descriptive caption for your image.

2.6 Reinforcements

Step 29: Cut a rectangle of cardboard 10cm x 20cm

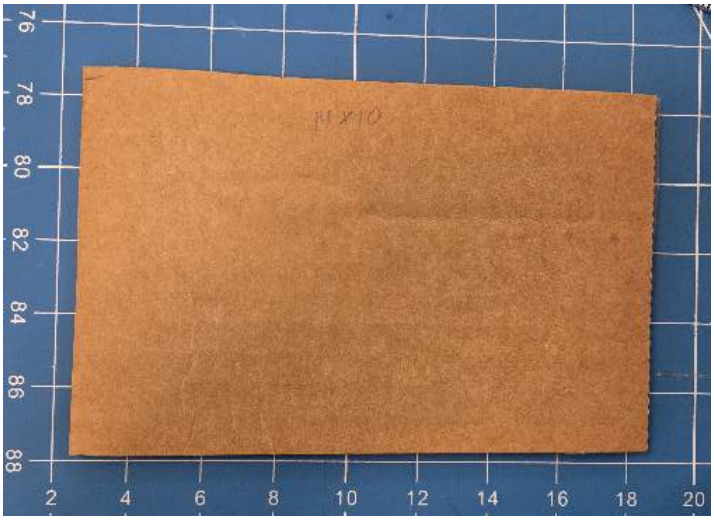


Figure 2: A descriptive caption for your image.

Step 30: Cut the rectangle across the diagonals to create two triangles.

Step 31: Glue the long leg (not the hypotenuse) of the triangle against the long part of the wing.

Step 32: Cut a rectangle of cardboard 10cm x 6cm

Step 33: Glue this piece along the short leg of the piece from **Step 30:** and the upright edge of the wing.

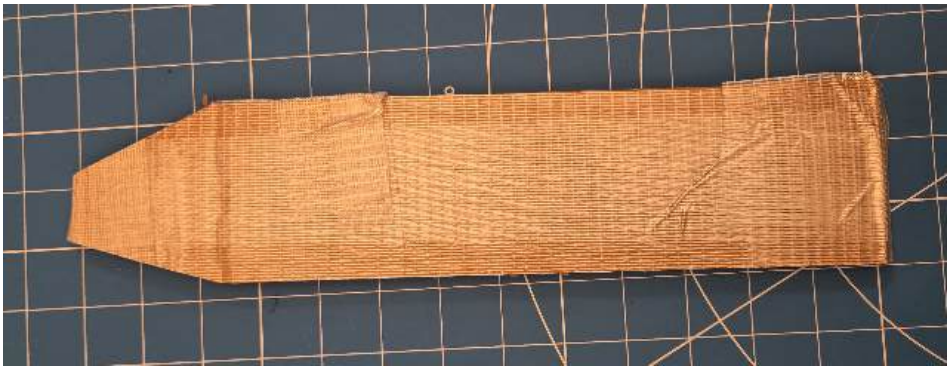
2.7 Building the Friction mechanism

2.7.1 Building the skid plate

Step 34: Cut a 26cm x 6cm rectangle of cardboard.

Step 35: (Optional) Cut off the corners from one side to make a pointed end.

Step 36: Wrap this piece in cardboard in order to reduce friction.

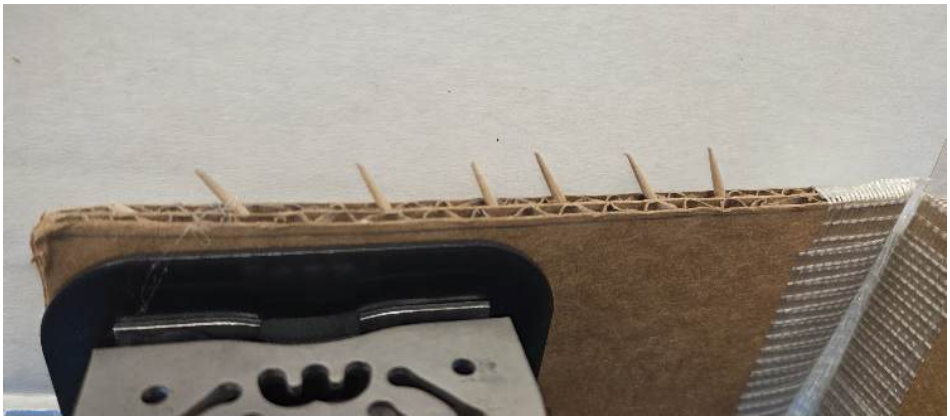


Step 37: Glue this piece to the flat bottom of the robot along the length of the center body.

Note: The pointed end should face the direction that is considered "forward".

2.7.2 Adding spikes to the wings

Step 38: Using toothpicks, slide them in-between the ply of the cardboard.



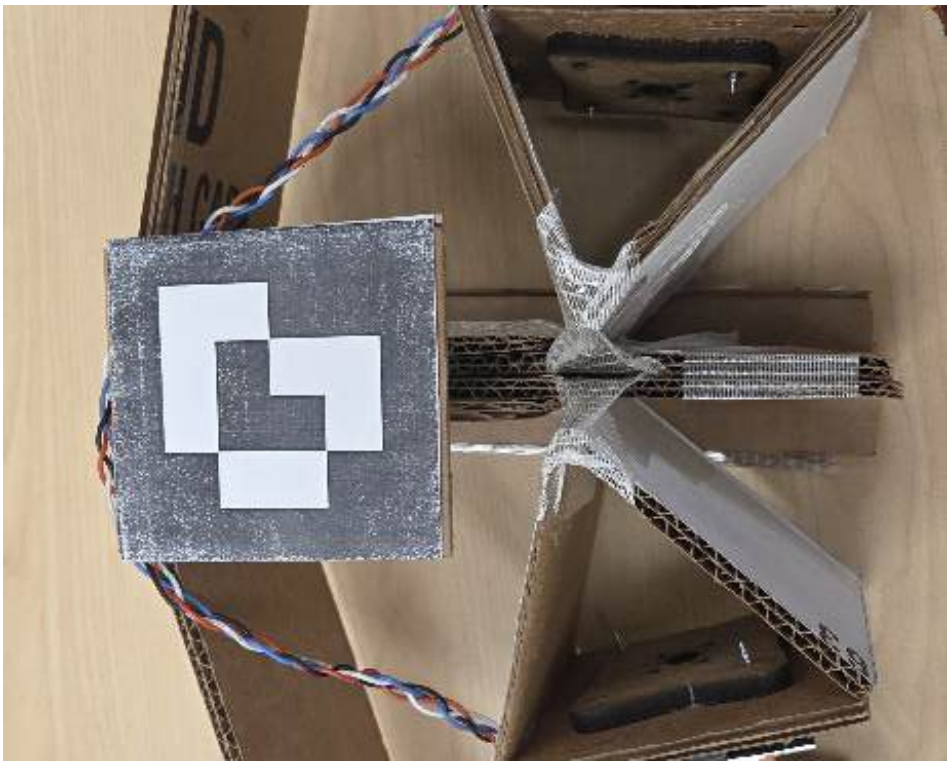
Note: They should provide friction in the opposite direction of motion.

Step 39: Reinforce the toothpicks with glue

2.8 Tag Mounting

Step 40: Attach a post for mounting the apriltag on the top of the robot.

Step 41: Make sure to leave a 'pixel' width of white border around the tag.



2.9 Miscellaneous

Note: If you would like to increase the speed of this robot, you can attach toothpicks into the bottom of the skid plate.

Step 42: Create a small hole where you intend to place the toothpicks. Note: This makes poking them through the tape easier.

Step 43: Insert toothpicks into the skid plate at the same angle as those on the wings.

Step 44: Glue the toothpicks into place.

References

[FSSR17] Ian Fitzner, Yue Sun, Vikram Sachdeva, and Shai Revzen. Rapidly prototyping robots: Using plates and reinforced flexures. *IEEE Robotics Automation Magazine*, PP:1–1, 02 2017.